

Answer questions as indicated. Closed book/Closed Notes/ NO calculators.

1 Basic Concepts—20 points

Circle the correct answer. Each problem in this section is worth 2 points.

Ten True/False statements. Things you should know/picked up from lecture/reading, etc.

2 Program Analysis—20 points

Problem 11. There are numerous errors in the program below. **Circle only ten and describe why it is an error.** Each error is worth two points.

```
// test2.cpp
#include <iostream.h>
#include <iomanip.h>
include <stdlib.h>

ifstream inFile;

int IsVowel( char c );

main() {
    outFile.open( "test.in", ios::in );

    /* analyze input file
    char ch;
    while( inFile << ch )
    (
        if( IsVowl(ch) )
            cout << ch >> "is a vowel" << endl
        else
            if( ch == "\n" ) cout << endl;
                lines++;
            else
                chars++;
    )

    cout << 'Results\n';
    cout << " Lines: " << setw(7) << lines + endl;
    cout << " Chars: " << setw(7) << chars ;

    return 0;
```

```

}

int IsVowel( char ch ) {
    int rVal = 1;
    if( ch == 'a' || ch == 'e' || ch == "i" ||
        ch == 'p' || ch == 'u' )
        rVal = 1;
    return rVal;
}

```

3 Program Output Analysis—15 points

Fill in the blank. Each problem in this section is worth 3 points.

Problems 12–14 refer to the following code fragment.

```

if( x >= 2 )
    if( y >= 2 )
        cout << x * y;
    else
        cout << x / y;
else
    cout << y - x;

```

Problem 12. What is the output if $x = 3$ and $y = 3$? _____

Problem 13. What is the output if $x = 3$ and $y = -3$? _____

Problem 14. What is the output if $x = -3$ and $y = 3$? _____

Problems 15 and 16 refer to the following code fragment.

```

main()
{
    int i, j = 1;
    for( i = 2 ; i <= 7 ; i += 4 ) {
        j = func( i, j );
    }
}

int func( int i, int j ) {
    if( i*4-j%3 >= 4 )
        cout << ++i << " " << j << endl;
    else
        cout << i++ << " " << ++j << endl;
    return j;
}

```

Problem 15. _____

Problem 16. _____

4 Functions—25 points

For all problems in this section, show all additional variable names and types that you choose to use. Use meaningful function names!

Problem 17 (5 points). Write a function that will print $\cos(x)$ for $x = -90$ to 90 degrees in 10 degree increments. Output is written to the screen.

Problem 18 (5 points). Write a function that will return 1 if a character value is within the first 13 uppercase characters (A..M) otherwise the function will return 0. The character to be analyzed is passed to the function.

Problem 19 (7 points). Write a function that calculates the charges for a given amount of electricity usage (in kilowatt hours) using the information in the table below.

First 25 kWh	\$10.00 minimum
Next 25 kWh	3.0 cents per kWh
Above 50 kWh	4.25 cents per kWh

Problem 20 (8 points). Some people find the syntax of Pascal more appealing for output. `Println(fOut, r);` instead of `fOut << r;` Write a `Println()` function that will print a single real number to an output file stream—the function moves the output *pointer* to the next line.

5 Program—20 points

Show all additional variable names and types that you choose to use when writing this program. Use meaningful function names!

Problem 21. Write a *complete* program that plots the following function $y = x^3 + 2 \tan(x)$ for $x = -\pi.. \pi$. Your main program must call a function that calculates this function. Upon returning from the function, your program must call the following function:

```
Plot(ofstream& fOut, double x, double y, double yMin, double yMax)
```

Bonus Problem: (2 points) Why are arrays useful?